

CHAPTER VI

PROBABLE LOSSES IN FUTURE WARS

I.—STATISTICS FOR ESTIMATING LOSSES.

Cold Steel.—The use of the bayonet, the lance, and the sword have not changed. As we have shown in detail in another place the proportion of casualties caused by cold steel is insignificant.

Small Arms.—Since the last great wars the power of arms has grown immensely and every day witnesses fresh improvements.

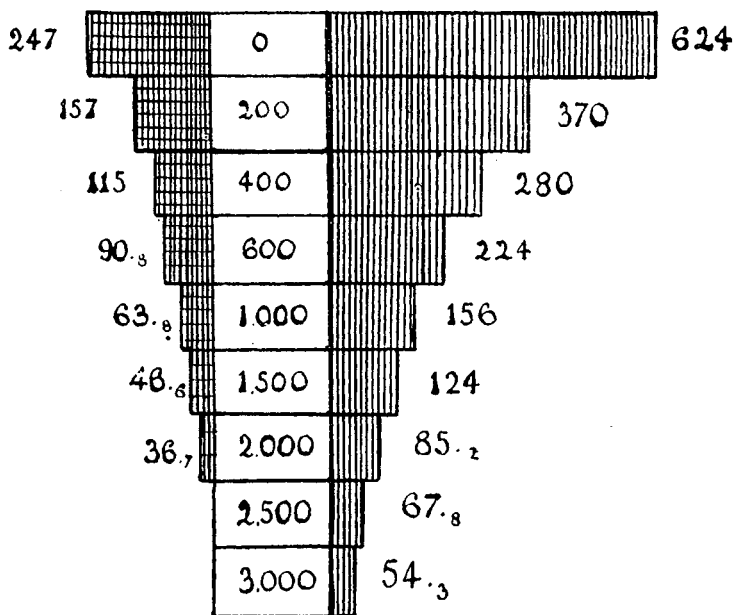
Let us quote some facts as example. In Germany, Austria, France, Russia, England, and Turkey a rifle with a calibre of from 7.62 to 8 mil. is employed. The distinctive feature of these weapons is the force of the blow, depending from greater initial speed and rotation of the bullet. This initial speed varies from 680 to 700 yards a second, and the number of revolutions from 2475 to 2640 a second. In the Italian, Dutch and Roumanian armies rifles have been adopted with a calibre of 6.5 mil., with an initial speed of 750 yards, and rotation 3830 a second. In the United States a 6-mil. rifle has been adopted. In Germany and Austria experiments with a 5.0-mil. rifle gave remarkable results. The significance of these changes may be understood from the fact that the penetrative force of the 6.5-mil. rifle is 44 per cent. greater than that of the 8-mil. rifle.

The effect of a rifle shot depends first of all upon the energy preserved by the bullet on reaching its target and then upon the weight of the bullet in relation to its diameter

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and upon the speed of its flight. The following diagram illustrates the difference in power of the rifles of 1877 and 1890.

Amount in Metro-Kilogrammes of Living Force of a Bullet on each Quadratic Centimetre of its Transverse Area on Striking Obstacles at various Ranges.



As concerns the 5-mil. bullets their striking force very considerably exceeds that of the 7.66-mil. bullet.

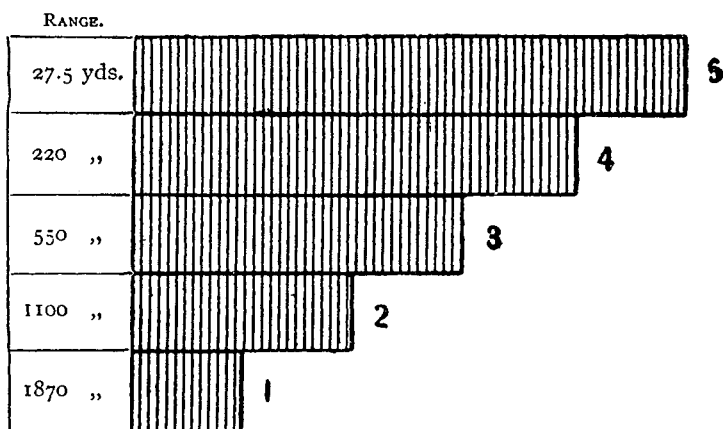
What will be the effect of such projectiles when employed in war by soldiers equal in equipment and training it is difficult to foretell precisely. Nevertheless such experiments and investigations as have been made help us to form a very vivid picture of the future battlefield.

Experiments in the use of the 5-mil. Mauser rifle

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against the carcasses of horses gave the following results. From a distance of 27, 220, 550, 1100, and 1870 yards, the bullets penetrated 5, 4, 3, 2, and 1 carcasses of horses, in each case preserving sufficient energy to penetrate to some extent the following carcass.

*Number of Horses' Carcasses Penetrated by the Bullets of the
Mauser 5 Mil. Rifle at various Ranges.*



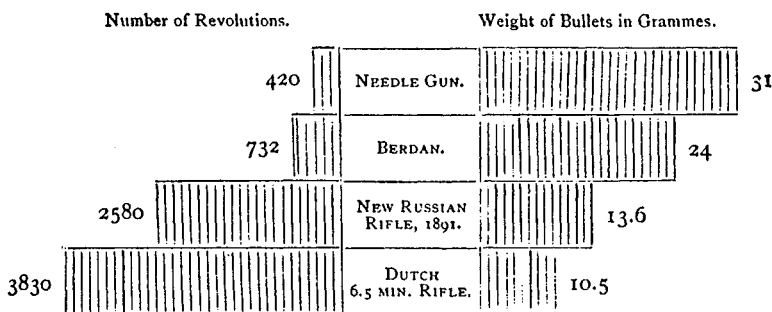
The enormous energy of such projectiles will for another reason cause an increase in the losses of war. Modern covered bullets are effective even in piercing metal. When the old round leaden bullets were used, a tree three inches thick or an earthwork twenty inches thick was an effective protection for soldiers. The modern small-calibre bullet will penetrate earth to the thickness of $78\frac{1}{2}$ inches, pierce through a tree and strike those who shelter behind it. In olden times the second rank considered itself protected from danger by the first, the coward took refuge behind a companion. The modern bullet may not only penetrate soldiers in the first two, but even in the third rank.

From this we see that the number of victims of the modern bullet may be five times greater than that of the old.

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In considering the degree of danger in battle the number of revolutions of a bullet has great importance. The following diagram shows the weight and rotation of bullets in use at various times.

Rotation and Weight of Bullets of Various Rifles.



This question has much importance, for upon striking something hard, such as the branch of a tree or a thick bone, the bullet takes an irregular position, and as its revolution continues it causes very serious wounds. It is for this reason that the intervention of a tree or a brick if it be insufficient to stop the bullet only makes it more dangerous. In Nirschau, in crushing the disturbances among the miners, but ten shots were fired, yet seven persons were killed and twenty-five wounded from a distance of from thirty to eighty paces. Many others slightly wounded concealed their injuries so as to escape legal prosecution. Each bullet struck from three to four men. This is explained by the thickness of the mob and the shortness of range. Of the wounded men six died, so that the percentage of death from wounds was 24 per cent., while in the war of 1870 it was only 12 per cent. The general mortality among those struck by bullets was 40.6 per cent.

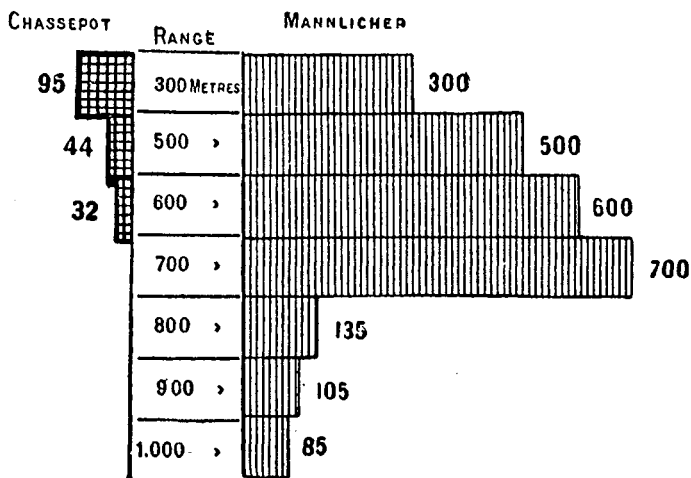
It cannot be doubted that the immense increase in the penetrative force of bullets, and the gravity of the injuries inflicted, will be one of the most striking characteristics of

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a future war. The effect of the deformation of bullets on striking hard substances will also be considerable, but concerning this we have no statistics.

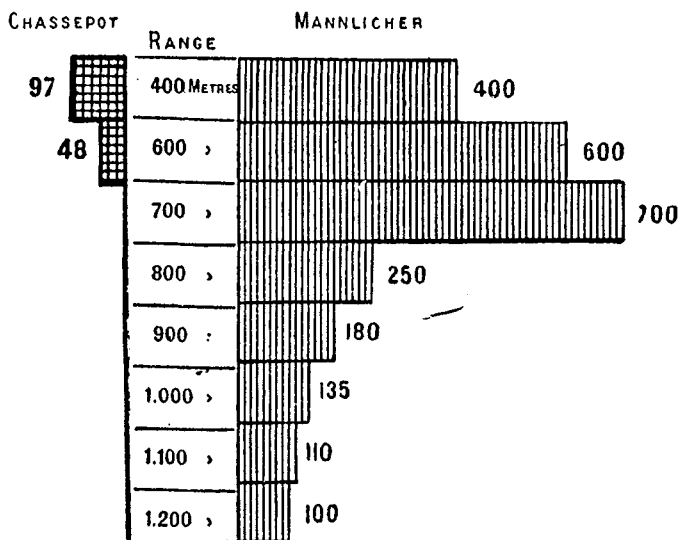
The first quality of a rifle is accuracy of fire. In this respect modern weapons possess qualities which ensure a number of casualties incomparably greater than in the past. The bullet of the 6-mil. Mannlicher rifle for a distance of 750 yards will fly so close to the ground that it will strike everything in the line of fire for that distance. With the rifles employed in the war of 1870, the effective distance in a range of 650 yards was 30 yards for the Dreuze and 35 yards for the chassepot. In other words the field of death has grown twenty times. At a greater range than 750 yards the bullets of 1870 almost always struck soldiers on the point of fall; at the present time the Mannlicher bullet aimed at a target 960 yards away, flies so low that it would strike a man for 110 yards of its flight. Even at a range of 1300 yards it would be effective for 62 yards. The following diagrams show this difference more plainly.

*Zone of Effective Fire against Infantry (1 m. 70 cm. in height)
at various Ranges.*



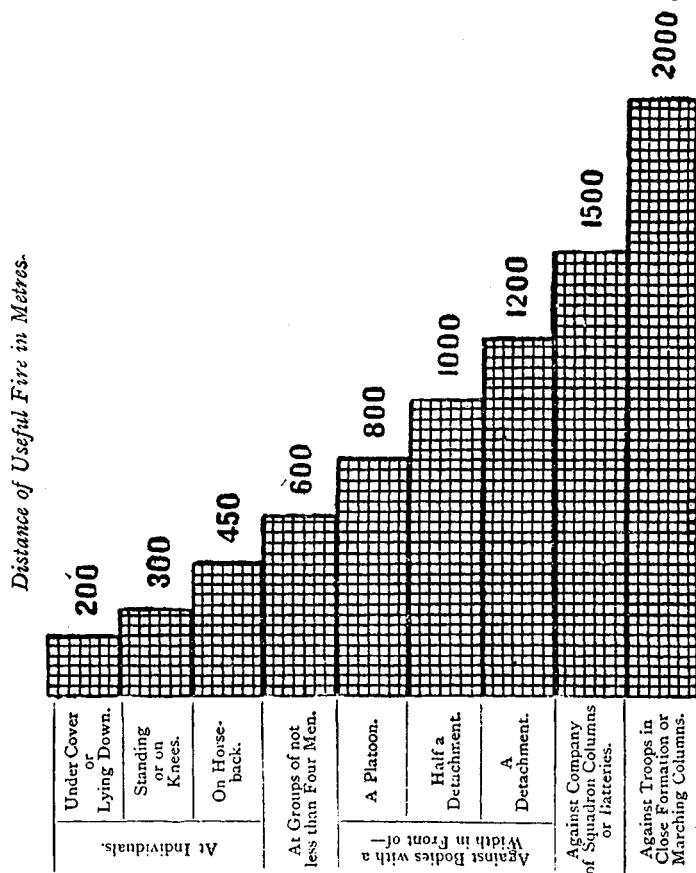
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Breadth of Zone of Effective Fire against Cavalry (2 m. 70 cm. in height) at various Ranges

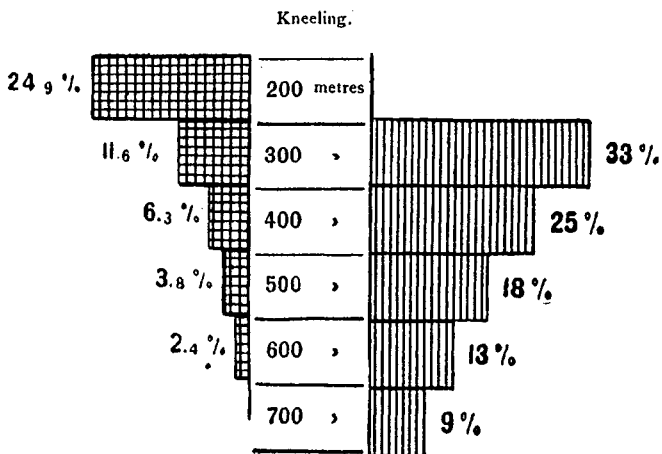
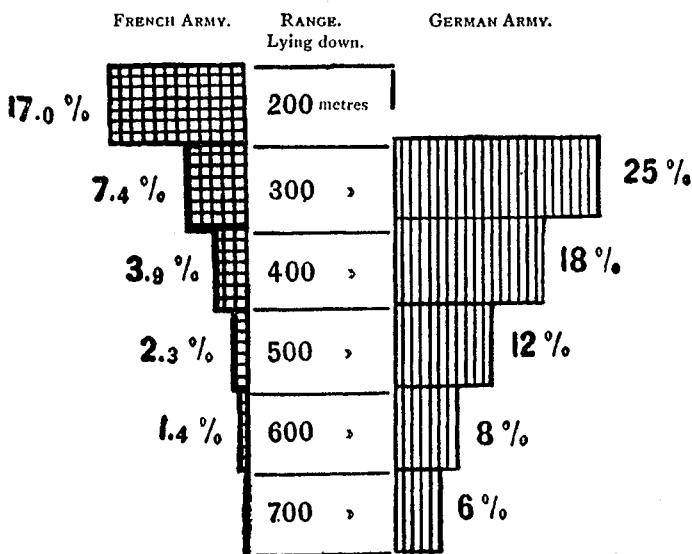


In all armies firing drill has been brought to perfection. The quantity of cartridges expended in training is incomparably greater than before, and the most ingenious methods have been devised for showing inaccuracy of fire or nervousness.

It is easy to see how these circumstances will influence future losses. At the present time the success of aim depends only upon the proper holding of the rifle. Raising the small-calibre rifle to the shoulder and firing mechanically and horizontally, at the present day the rifleman covers a space of 650 to 750 yards. Where in 1870 a special order was needed and attention had to be paid to its execution, the mere mechanical use of the weapon is now necessary. For this reason, too, the range of useful fire, which will not involve waste of cartridges, has immensely increased, as the following diagram shows :

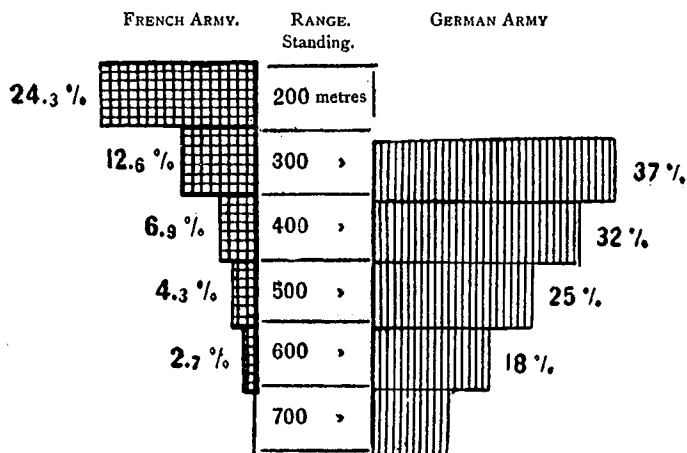


The effect of improved training may be shown by the following figures. In Russia up to 1874, at 650 yards range the accuracy of fire of a battalion was 25 per cent. ; to-day, with improved training, it is as high as 69 per cent., or almost three times better. The modern rifle so nearly approaches perfection that a well-trained marksman almost certainly hits his mark. In the French and German armies the percentages of successful fire against an infantryman are shown by the following diagrams :

Percentage of Hits in Fire at One Infantryman.

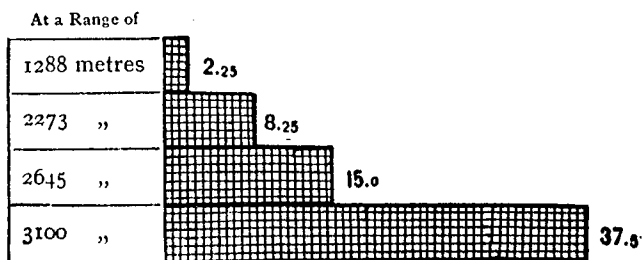
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Percentage of Hits in Fire at One Infantryman.



Besides these improvements in weapons all tending to the increase of casualties, the systems of measuring distances have been improved at the same rate. The improved instrument of Colonel Paskevitch adopted by the Russian army ten years ago measures up to 7000 yards in three minutes, while it weighs less than 72.6 lbs. The accuracy of this instrument may be seen from the following diagram ;

Deviation of the Paskevitch Instrument in Metres.

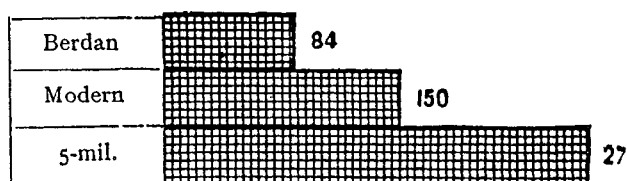


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In later years even more accurate instruments have been constructed.

The increase in the number of cartridges, already mentioned in another connection, carried by soldiers is another factor increasing losses. With the Berdan rifle a Russian infantryman carried 84 cartridges, with the new weapons 150 cartridges; with the 5-mil. rifle the number carried will reach 270.

Number of Cartridges carried by one Soldier with Different Rifles.



With an even smaller calibre the number of cartridges carried will be from 380 to 575. If we assume that, without having recourse to the reserve, the number of cartridges now carried will be expended, it is easy to see how losses will be increased. The smokelessness of powder is another factor in increasing losses. But to this we have already referred more than once.

On the above statistics we have constructed the following table showing how the old loss of 18 per cent. from rifle fire will be increased, in all cases the lowest conceivable increase having been taken :

From increase of energy	7 per cent.
” ” in revolutions and from de-	
formation of bullet	4 ”
” ” in accuracy	18 ”
” improved means of observation and	
measuring	2 ”
” absence of smoke, &c.	2 ”
” increase in quantity of cartridges	12 ”

From which it appears that the general loss from rifle-

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fire will grow to 63 per cent. That this estimate is not exaggerated is shown by the Chilian war. Yet, as already stated in the beginning of this work, Professor Gebler gives even a higher value to the effectiveness of the new weapons :

Rifle of 1871	.	.	.	.	100 per cent.
French rifle of 1886	.	.	.	.	433 "
German rifle	.	.	.	.	474 "
5-mil. rifle	.	.	.	.	1337 "

In comparison with this our calculations appear very moderate.

Artillery.—Of the effect of artillery fire the past can give little idea. Such authoritative writers as General Wille, Professor Pototski, and Captain Moch declare that the quick-firing guns now built in France, Germany, and Russia are at least twice as effective as the 1891 type, of which Langlois said : " We have before us a whole series of improvements of the utmost importance, and must admit that war material has become entirely different from that employed in past wars." In addition to this the quantity of artillery has increased immensely.

In the present day as many projectiles can be fired in the course of a few minutes as were before fired during a whole battle, the best guns giving in the course of three minutes 83 shots and the worst 65. The accuracy of fire is no less remarkable. From a distance of 2000 yards guns have sent four projectiles into the same hole.

A comparison of the effect of 1000 rifle bullets fired by infantrymen attacking in open order with the effect of shrapnel showed that one round of shrapnel is effective over a space twice as long as, and not less wide than, the rifle fire. Experiments show that the fragments of these shells are thrown over a space 860 yards long and 420 wide.

On the basis of comparisons made by Langlois, it appears that the French gun of 1891 is twenty times more effective than that of 1870. In the same period the number of guns has increased from 780 to 4512. From

which it appears that the French artillery of 1891 was 116 times more powerful than that of 1871. When the new quick-firing guns now being prepared—which in the opinion of specialists will be twice as effective as those of 1891—are completed, the French artillery will be approximately 232 times more effective than that employed against the Germans in 1870. It may be assumed that the losses will be correspondingly greater. The quantity of ammunition carried will be twice as great as was carried with the former arms. On the estimates of Langlois, in a future battle lasting only two days, every gun will require no less than 267 rounds of ammunition, while if the battle extend over three to four days 500 rounds will be required. With the 136–140 rounds per gun in the armies of the Triple and Dual Alliances, according to the calculations of General Müller, more than 11,000,000 men might be killed and wounded. With 267 rounds per gun 22,000,000 might be killed and wounded, and with 500 rounds 41,000,000. In consequence, it appears that artillery fire alone might exterminate eight times the number of the armies which could be placed on the battlefield. These figures seem absurd. Nevertheless, they are based on the detailed calculations of Langlois.

In the war of 1870 the losses from artillery fire amounted to 9 per cent. of the armies engaged. What they will be in a future war it is impossible even to guess. The quantity of artillery has increased, each gun being twenty times, and, since the introduction of the latest types, forty times more powerful than those of 1870. Even leaving the increase in the number of guns out of account, the losses of 9 per cent. would be replaced by losses of 180 per cent., though these new guns must in a short time give way to others more perfect. If we base our estimates on these new guns the results would be absurd, not through irregularity of reasoning, but simply because they would show that instruments had been prepared capable of destroying armies many times more numerous than could be placed in the field.

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II.—INFLUENCE OF MODERN TACTICS IN INCREASING LOSSES.

In consequence of the use of long-range weapons and smokeless powder armies will be obliged to surround themselves, for a considerable distance, with commands of sharpshooters so as to render reconnaissance by the enemy difficult. The discovery and destruction of such commands will be a task of no small difficulty. In 1870 for the protection of the German rear 145,712 men with 5945 horses and 80 guns were employed. And since the strength of the infantry then operating was something over 455,000, it will be seen that a sixth part of the whole army had to be set aside to protect communications. Nevertheless the French sharpshooters more than once succeeded in cutting the German communications and causing confusion. If we bear in mind that these *franc tireurs* were exclusively on foot and had no military training, it will be understood what vast forces would have been required to guard communications from regular chasseur commands and cavalry.

In the present time, in all countries, an attempt is made to give some military training to all men who might be required for service in time of war. Such a state of affairs as resulted in France in 1870, when Paris was actually besieged, and yet hundreds of thousands of men liable to service continued to attend to their civil occupations, will not again be seen. At the very outbreak of war practically all the population liable to service will be either summoned to the operating army, or appointed to serve in the second and third strategical lines.

After this of course there will remain in the country a sufficient number of grown men for such work as the obtaining of information as to the enemy, and the burning of bridges and stores, &c. But generally it must be admitted that even partisan operations will be carried on by organised bodies, and systematically. A result of this will be that even a little war in the future will take a serious form.

During the manœuvres of the German army in Alsace-Lorraine attempts were made at transporting infantry in carriages for the purpose of doubling or even trebling rapidity of movement. Two experiments were made. The infantry either covered in one day a great distance, namely, $49\frac{3}{4}$ miles with halts for food and change of horses, or made two marches a day, one on foot and the other in carriages.

Military operations will begin in the form of a little war, considerable masses of cavalry being constantly maintained on frontiers, which will be immediately crossed, upon which reconnoitring detachments from both sides will come into contact with one another. It will be most important for such detachments to have light infantry with them in carriages. Of course their movements will be characterised less by regularity than by speed. But the command will be given to picked, experienced officers, and as a result such bodies will be much more dangerous than the French *franc tireurs* of 1870. At the present day a marksman from a distance of not more than 800 paces may pick off men at will, and as smoke will no longer betray his position his fire may be very deadly.

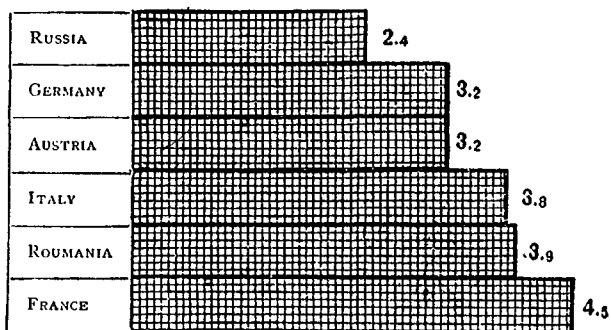
The losses suffered in attacks on fortified positions will constantly grow, side by side with improvements in arms. The attackers must advance in loose formation, taking advantage of inequalities in the ground, and of the light earthworks which they will throw up with the aid of trenching instruments. In the war of 1877 the Russian soldiers were imperfectly equipped, and ill-instructed in the making of such works. Yet, in spite of this, earthworks fully proved their value. It was such earthworks which prevented the Turks from driving the Russian army from the Shipka, notwithstanding the immense sacrifices they made. On the other hand picked Russian troops, with a numerical superiority of 25 per cent. and desperate bravery, for a long time failed to take the redoubt of Gorni Dubnyak although they got within a hundred paces of it. In the majority of unsuccessful attacks on Plevna the

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Russian troops, after great loss, succeeded in getting within bayonet distance of the enemy; cases of nearer approach were very few.

Relying on the confidence with which the smokelessness and long range of his rifle inspire the soldier, commanders will stubbornly hold out in defensive positions, selecting natural cover and supplementing it with artificial defences. That earthworks will be had recourse to very often in the field is shown by the fact, that trenching instruments enter into the equipment of a certain proportion of all infantry. As further evidence, we might point to the instructions delivered to the Guards Corps in 1892 recommending defending bodies always to entrench themselves unless special orders be given to the contrary. It is interesting to see the degrees of equipment of European armies for such work.

Number of Sappers to 100 Infantrymen.



The Belgian authority General Brialmont considers that even the last proportion is insufficient. He declares that six sappers should go to every hundred infantry men. General Kilichen goes even farther and would have a sapper for every thirteen infantrymen.

In former times every irregularity in the ground was

considered an obstacle in military operations. At the present day knowledge of how to take advantage of these irregularities is a great factor of success. This view has become so generally accepted within the last twenty-five years that all governments have undertaken the examination and measuring of all fields where a future battle might take place. This circumstance is very important. If a Plevna could spring up suddenly upon an unexamined and unprepared spot, what will be the case in a future war when every inch of frontier territory has been prepared for defence ?

In the opinion of the most competent authorities the war of the future will result primarily in a series of battles for the possession of fortified positions. In addition to field works, the attacking troops will have to overcome auxiliary obstacles of every kind near the regular fortifications, that is, at the place where they will run the greatest risk from the defenders' fire. Such obstacles will be constructed of beams, wire nets, and pitfalls. Their destruction will require immense sacrifices. The effect of artillery upon such defences is insignificant. Wire nets can only be destroyed by taking them to pieces by men acquainted with the methods of construction. But for this much time will be required. Meantime the foremost of the attackers will be under strong fire from the defence, and may very easily fall under the fire of their own artillery which will be supporting the attack.

Rifle fire over the heads of advancing troops will be practised more often than before, and may prove the cause of great losses. "Observe," says General Skugarevski, "the results of firing in peace time. The targets stand at some hundreds of paces away, yet bullets sometimes furrow the ground at a few decades of paces from the marksman. And this in time of peace. What will happen in war ?" Still more dangerous will prove artillery fire over the heads of troops, since want of coolness, a difficult locality, the distance of the enemy and other unfavourable circumstances may cause inaccurate fire from which advanced troops might suffer severely.

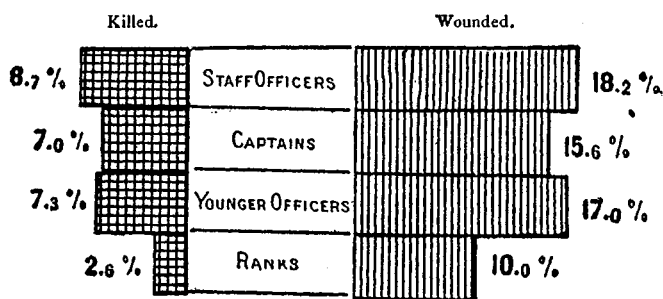
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The amount of losses will depend more or less upon the skill or otherwise with which men are led. Yet even in peace times a deficiency of fully trained officers is felt. It must not be forgotten that a considerable number of the higher officers in modern armies have never been under fire. With the present composition, operating armies can never be properly officered, since the formation of new armies will so exhaust the reserve of officers of the line that a battalion at the front will have no more than eight out of thirty. Thus for every one of such officers there will be three from the reserve who will be inferior in knowledge, in discretion, and in applicability to conditions. Unskilful tactics will immediately react unfavourably on the amount of the losses. The deficiency in fully trained officers will be all the more felt as they will lose heavily in the very beginning of the campaign. The experience of the last wars, although smokeless powder was not used, and the rule that officers were to be first picked off was not generally accepted, shows how quickly the number of officers on the field of battle will diminish. As a guide in this respect the Chilian war may again be taken. Figures referring to two battles only show that while the number of men killed and wounded was 13 per cent. and 60 per cent. respectively, the number of officers killed and wounded was 23 per cent. and 75 per cent. But if officers are not there to give the example, men will not attack. Prince Höhenlohe, in his "Letters on Artillery," relates the following incident which occurred in the vicinity of Paris: "After driving the enemy from a village its graveyard was occupied by half a company from one of our best regiments. Quite unexpectedly the enemy made a new attack and regained possession of the graveyard, which we were obliged to capture anew. On this being done, I asked the men of the half-company how they could have given up the graveyard to the enemy. The soldiers answered naively: 'But all our officers were killed, there was no one to tell us what to do, so we also went off.'"

The German army in the war of 1877 lost considerably in officers, as will be seen from the following diagram:

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Losses in the German Army in the War of 1870.



That is to say, the officers sustained twice as many in killed and three times as many in wounded as the lower ranks.

In consequence of improved means of destruction every meeting with an enemy will take a more threatening form than before, and every mistake, every delay, will have more serious consequences. The conditions of war have become enormously more complex. Yet for every hundred soldiers serving with the colours there will be taken from the reserves :

In Italy	.	.	.	.	.	260 men.
„ Austria	.	.	.	.	.	350 „
„ Germany	.	.	.	.	.	566 „
„ France	.	.	.	.	.	573 „
„ Russia	.	.	.	.	.	361 „

The majority of these reserves will have forgotten what they learnt in time of service. Of the officers also only a small proportion will be in a high state of efficiency. It would seem that with such conditions field instructions should be elaborated in times of peace, giving precise information as to tactical measures in every contingency. But, as we have already mentioned in another place, in this respect the different armies show deficiencies of various kinds. So far has the confusion gone that in the French

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army the expression is used "ordre, contre-ordre, dés-ordre." And this is very natural when we bear in mind the want of experience of the new conditions.

Some writers express the opinion that it is a mistake to issue general instructions regulating tactics in a future war, as under certain circumstances their literal interpretation has the most disastrous consequences. In former times when fire was incomparably slower and weaker, and escape from the zone of fire could be effected quickly, the losses from mistakes in tactics were insignificant. But such are the conditions now that a mistake may lead to the extermination of a whole body of troops within a few minutes. The danger has grown immensely, while the factors of safety have diminished. Smoke will no longer betray the position of an enemy's troops, reconnaissance in the face of long-range rifles will be difficult, and the attacking troops will attempt to approach the defenders to within a short distance, at which the ballistic forces of projectiles can no longer receive development, from this distance the deciding weapon, as in former battles, being the bayonet.

But what will be the losses sustained by attacking troops before they get within such a distance? The advance, of course, will be carried out cautiously and in loose formation. Such an advance against an enemy occupying a strong position and firing over measured distances will be extremely difficult and may even require a two-days' labour.

It is not strange then that certain authors declare that battles will continue three, four, and even fifteen days. Other specialists find that we are returning to the epoch of sieges. Belgrade, Mantua, and Plevna may be repeated. It is very likely that the attacking army, finding decisive victory impossible, will attempt to lock up the enemy on the spot, entrenching itself and making raids for the stoppage of his supplies until the besiegers are starved out.

As we have already explained, the quick and final decision of future battles is improbable. The latest im-

provements in small arms and artillery, and the teaching of troops to take advantage of localities, has increased the strength of defence. The modern rifle has immense power, and its use is simple and convenient. It will be extremely difficult to overcome the resistance of infantry in sheltered positions. Driven from one position it will quickly find natural obstacles—hillocks, pits, and groups of trees—which may serve as points for fresh opposition. The zone of deadly fire is much wider than before, and battles will be more stubborn and prolonged. Of such a sudden sweeping away of an enemy in the course of a few minutes as took place at Rossbach it is absurd even to think. The power of opposition of every military unit has increased so greatly that a division may now accept battle with a whole army corps, if only it be persuaded that reinforcements are hastening to the spot. The case already cited, of the manœuvres in Eastern Prussia, when a single division sustained an attack from a whole army corps until reinforced, is sufficient evidence of this. The scattering of immense masses over a considerable space means that a successful attack on one point by means of the concentration of superior forces may remain local, not resulting in any general attack on the chief forces of the defence.

In former times either of the combatants quickly acknowledged that the advantage lay with the other side, and therefore refused to continue the battle. The result and the trophy of victory was the possession of the battlefield. The majority of military writers consider the attainment of such a result very questionable.

From the opinions of many military writers the conclusion is inevitable that with the increase of range and fire, and in view of the difficulties with which assault is surrounded, a decisive victory in the event of numerical equality is possible only on the failure of ammunition on one side. But in view of the number of cartridges which soldiers now carry, and the immense reserves in the ammunition carts, it seems more likely, that before all cartridges have been expended, the losses will have been

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so great as to make a continuation of battle impossible. To the argument that night will interrupt the battle we find an answer in the fact that, thanks to the adoption of electric illuminations, the struggle will often continue or be renewed at night.

In all armies attempts are made to inspire the soldiers with the conviction that a determined assault is enough to make an enemy retreat. Thus, in the French field instructions we find it declared that "courageous and resolutely led infantry may assault, under the very strongest fire, even well-defended earthworks and capture them." But the above considerations are enough to show the difficulty of such an undertaking.

Supposing even that the defenders begin a retreat. The moment the attacking army closes its ranks for assault partisan operations on the side of the defenders will begin. Indeed, it may be said that the present rifle, firing smokeless powder, is primarily a partisan weapon, since armed with it even a small body of troops in a sheltered position may inflict immense losses from a great distance. As the attackers approach, the thin flexible first line of the defence will retreat. It will annoy the enemy with its fire, forcing him to extend his formation, and then renew the manœuvre at other points.

While the first line of the defenders will thus impede the assault, the main body will have opportunity to form anew and act according to circumstances. The attacking army, though convinced of victory, finding that it cannot get into touch with the rear-guard of the enemy, which alternately vanishes and reappears, now on its flanks, now in front, will lose confidence, while the defenders will take heart again.

It is obvious that, with the old powder, the smoke of which betrayed the fighting front of the enemy and even approximately indicated its strength, such manœuvres were too dangerous to carry out. It would be a mistake to think that for the carrying on of such operations picked troops are required. The ordinary trained soldier is quite capable. Every soldier knows that two

or three brigades cannot entirely stop the advance of an army. But seeing that the attackers may be so impeded that they will gain no more than four or five miles in a day, the defenders will have good cause to hope and wait for a favourable turn of affairs.

From this it may be seen how immensely smokeless powder has increased the strength of defence. It is true that in past wars we find many examples of stubborn rear-guard actions facilitating orderly retreat. But even in those cases victory was too evident and irrevocable, and this encouraged the pursuers. The vanquished tried as quickly as possible to get out of fire. Nowadays with quick-firing and long-range guns the first few miles of retreat will prove more dangerous than the defence of a position, but the chain of marksmen covering the retreat may greatly delay the course of the attack.

It was Marshal St. Cyr who declared that "a brave army consists of one-third of soldiers actually brave, one-third of those who might be brave under special circumstances, and a remaining third consisting of cowards." With the increase of culture and prosperity nervousness has also increased, and in modern, especially in Western European armies, a considerable proportion of men will be found unaccustomed to heavy physical labour and to forced marches. To this category the majority of manufacturing labourers will belong. Nervousness will be all the more noticeable since night attacks are strongly recommended by many military writers, and undoubtedly these will be made more often than in past wars. Even the expectation of a battle by night will cause alarm and give birth to nervous excitement. This question of the influence of nervousness on losses in time of war has attracted the attention of several medical writers, and some have expressed the opinion that a considerable number of soldiers will be driven mad. The famous Prussian Minister of War, Von Roon, writing from Nikelsburg in 1866, said: "Increased work and the quantity and variety of impressions have so irritated my nerves that it seems as if fires were bursting out in my brain."

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We have already referred many times to the probability of prolonged wars in the future. Against this probability only one consideration may be placed: the difficulty of provisioning immense armies and the probability of famine in those countries which in times of peace live upon imported corn. With the exception of Russia and Austria-Hungary, not a single country in Europe is in a position to feed its own population. Yet Montecuculli said: "Hunger is more terrible than iron, and want of food will destroy more armies than battles." Frederick II. declared that the greatest military plans might be destroyed by want of provisions. But the army of Frederick II. was a mere handful in comparison with the armies of to-day. It is true that ancient history presents examples of immense hordes entering upon war. But these wars were generally decided by a few blows, for there existed neither rapid communications for the purpose of reinforcement, nor regular defensive lines. Modern history shows many instances of prolonged wars. But it must be remembered that the Thirty Years' and the Seven Years' wars were not uninterrupted, and that the armies engaged went into winter quarters where they were regularly provisioned, and in spring recommenced operations resulting only in partial successes, the gaining of a battle, the taking of a fortress, followed by another stoppage of operations. Thus the long wars of modern history may be regarded as a series of short campaigns. In recent times, side by side with the long Crimean and North American Civil wars, we find the short campaigns of 1859 and 1866. Taking the last as example, the German military writer Rüstow jumps to a conclusion as to the "shortness of war" which is guaranteed by improved communications and arms. Such theorists were surprised by the fact that even the war of 1870-71 occupied seven months, although it, of course, may be considered as short having regard to the forces employed and the vastness of the results.

In the future, by virtue of concluded alliances, the whole populations of great states will take the field, every state having, in the course of years, made immense efforts

to fortify its frontiers. In the last ten years France expended forty millions of pounds sterling on fortifications, the very nature of these having entirely changed. Instead of the old fortresses visible from afar and isolated forts easily passed or taken, we have fortified camps which can hardly be seen from a short distance, polygons with casemated quarters, where whole armies may be sheltered.

On whatever plans operations are founded the side which carries the war into an enemy's territory will meet with tremendous resources for defence. Uncounted millions have been spent to ensure that no great superiority of force can be attained by an invader whatever the difference in the time of mobilisation. Preparations have been made by all governments to stop the invaders, if not at the very frontier, then not very far in the interior of the country.

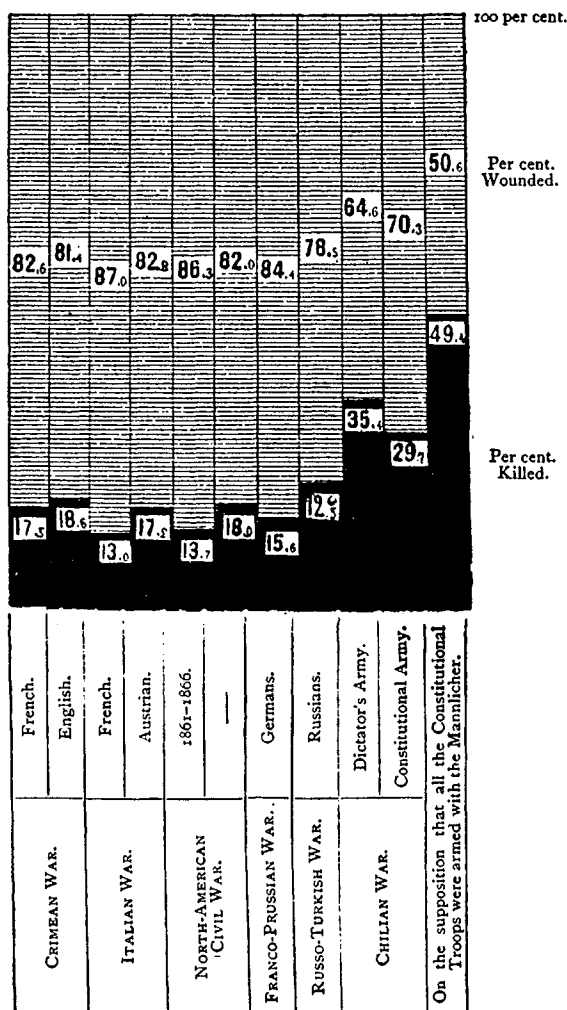
In the present condition of military organisation the responsibility for the supply of armies will rest upon the higher commanders who in times of peace have little to do with this affair. Meantime the more numerous the army and the slower its movements the greater will be the difficulty met with in supplying its wants. And in view of the long delays ensured by fortifications and defensive lines, the labour of provisioning troops will be immense. In former times it was comparatively easy to feed troops in time of war. Armies were small and moved rapidly from place to place. The present state of affairs is very different ; and delay in the provisioning of armies will not only cause great difficulties, but will have its influence in increased losses.

We have attempted elsewhere to treat briefly of the difficulties attendant on the care of the wounded in future wars. This question has also an important bearing on the question of losses, as the number of killed to a considerable extent depends upon the efficiency of the ambulance service.

The percentage of killed will grow considerably. The diagram opposite shows how modern small arms, not-

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Influence of the Quality of Firearms on the Relations of Killed to Wounded.



withstanding their small calibre, are more dangerous than the old. Which shows that if all armies had been equipped with the Mannlicher rifle the proportion of killed would have been as high as 49.4 per cent., or practically equal to the number of wounded. This diagram has been formed from the general figures of losses, and to ensure accuracy it would be necessary to deduct the victims of artillery fire and cold steel. But as we have elsewhere explained an immense proportion of casualties are caused by rifle fire, so that the diagram is, probably, approximately correct.

The losses from wounds constitute but a small part of the total number of sacrifices. In past wars they have been but a fifth, the remaining four-fifths representing losses from sickness and exhaustion. Napoleon in the march to Moscow lost two-thirds of his army though he fought only one general engagement. The Russian armies operating against him, in the course of five months lost four-fifths of their strength. The losses of the Federal armies in the Civil War in two years (June 1861 to June 1863) amounted to 53.2 deaths in the thousand, of which only 8.6 were caused by wounds, and 44.6 by sickness. The mortality from sickness among the officers amounted to 22 in the thousand, while among the men it rose to 46. In the Franco-Prussian war the losses of the Germans were 34.7 per cent. from wounds and only 30 per cent. from sickness. But this is explained by the shortness of the campaign, and by the fact that, being greatly superior in numbers, the Germans were able to send their sick home. On the French side these proportions were reversed.

During the last war with Turkey the Russian armies, numbering in all 592,085 men, lost 16,578 in battle and 44,431 from sickness. In *L'Hygiène Militaire*, 1886, Morache draws up the following analysis of losses in modern wars:

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War.	Strength of Army.	Losses.		Deaths in 1000 Men.	
		From Wounds.	From Sickness.	From Wounds.	From Sickness.
Crimean, French army	309,268	20,240	75,375	64	236
Crimean, English army	97,864	4,607	17,580	47	179
War of 1859, in French army . .	128,225	5,498	2,040	42	15
Mexican, in French army	35,000	1,729	4,925	49	140
Franco-German, in the German army	900,000	30,491	14,259	33	15
Russo-Turkish, in the Russian armies . .	737,355	36,455	83,446	49	113
Bosnian Expedition, in the Austrian army . .	260,000	1,326	2,168	5	8

In a future war, for many reasons, we must expect even more deadly results. Bad and insufficient food, in consequence of the difficulty of provisioning immense masses, will mean the increase of sickness; and the overcrowding of the sick at certain points will complicate the danger both from sickness and from wounds, and thereby increase the mortality.

It is further necessary to bear in mind that modern armies will consist of soldiers less accustomed to marching and deprivation, while notwithstanding the lightness of his rifle, the infantryman has to carry a greater weight than before. The German writer Turnwald, who especially studied the question of the weight which the soldier can bear, finds that it ought not to exceed 57 pounds, that is, a third of his own weight. At the present time the infantryman carries 88 pounds. The weight of the equipment is undoubtedly a factor in causing the exhaustion and susceptibility to sickness observed among the soldiers during

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manœuvres. During manœuvres carried on by the garrison of Strasbourg no less than a third of the soldiers fell out, and the hospitals were filled with sick soldiers. It is true that this was in winter, and many cases were caused by frostbite.

Basing his judgment on the war of 1870-71, in which he took part, General Von der Goltz observes that "in a long and wearisome war armies undoubtedly deteriorate in quality. Exhaustion and weariness may be borne for several weeks, but not for many months. It is hard to remain a hero, ever ready for self-sacrifice, after daily battles and constant danger, after long marches through the mud, and nights passed on the wet earth; all this has a bad effect on courage."